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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/809,663	03/15/2001	Mukesh V. Khare	FIS920000396US1 / I30-000	5741

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EXAMINER	
TOLEDO, FERNANDO L	

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 02/28/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/809,663	KHARE ET AL.	
	Examiner	Art Unit	
	Fernando Toledo	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 March 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) *9-13* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 March 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *5* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. I. Claims 1 – 8, drawn to a method, classified in class 438, subclass 786.

II. Claims 9 – 13, drawn to a device, classified in class 257, subclass 1+.

The inventions are distinct, each from the other because of the following reasons:

Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the device does not have to be subjected to a plasma nitridation process.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

2. During a telephone conversation with Sean Sullivan on February 19, 2002 a provisional election was made with traverse to prosecute the invention I, claims 1 - 8. *Affirmation of this election must be made by applicant in replying to this Office action.* Claims 9 – 13 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

3. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim

remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1 and 5 are rejected under 35 U.S.C. 102(b) as being anticipated by Kraft et al. (U. S. patent 6,136,654).

In re claim 1, Kraft in the U. S. patent 6,136,654; figures 1 – 8 and related text discloses forming an initial oxynitride layer 14 upon a substrate material, the oxynitride layer having an initial physical thickness (column 3, lines 52 – 56); subjecting the initial oxynitride layer to plasma nitridiation, the plasma nitridation resulting in final oxynitride layer, the final oxynitride layer having a final physical thickness (column 3, lines 59 – 67 and column 4, lines 1 – 11).

In re claim 5, Kraft teaches wherein the final oxynitride layer has a nitrogen concentration of 0.1 to 57 atomic % (column 5, lines 24 – 28). It is inherent that the range disclosed by Kraft will fall in the range of "at least 2.0×10^{15} atoms/cm^{2}" depending on the final measurements of the device of Kraft.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 2 – 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kraft as applied to claims 1 and 5 above.

In re claim 2, Kraft does not show wherein the final physical thickness exceeds the initial thickness by less than 5 Å.

However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the final physical thickness exceeds the initial thickness by less than 5 Å in the invention of Kraft, since insulation thicknesses are well-known process variables and finding the optimum or workable ranges of those thicknesses requires only ordinary skill in the art. Note that the specification contains no disclosure of either the critical nature of the claimed thicknesses or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen thicknesses or upon another variable recited in a claim, the Applicant must show that the chosen thicknesses are critical. *In re Woodruf*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

In re claim 3, Kraft does not disclose wherein the final physical thickness is less than 20 Å.

However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the final physical thickness less than 20 Å in the invention of Kraft, since insulation thicknesses are well-known process variables and finding the optimum or workable ranges of those thicknesses requires only ordinary skill

in the art. Note that the specification contains no disclosure of either the critical nature of the claimed thicknesses or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen thicknesses or upon another variable recited in a claim, the Applicant must show that the chosen thicknesses are critical. *In re Woodruf*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

In re claim 3, Kraft does not disclose wherein the final physical thickness is less than 15 Å.

However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the final physical thickness less than 15 Å in the invention of Kraft, since insulation thicknesses are well-known process variables and finding the optimum or workable ranges of those thicknesses requires only ordinary skill in the art. Note that the specification contains no disclosure of either the critical nature of the claimed thicknesses or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen thicknesses or upon another variable recited in a claim, the Applicant must show that the chosen thicknesses are critical. *In re Woodruf*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

6. Claims 6 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kraft as applied to claims 1 and 5 above, and further in view of Ito et al. (U. S. patent 4,980,307).

In re claim 6, Kraft does not teach wherein the initial oxynitride layer is formed upon the substrate by ionically implanting nitrogen atoms into the substrate and

oxidizing the substrate, following the substrate being ionically implanted with nitrogen atoms.

However, Ito in the U. S. patent 4,980,307 discloses forming an oxynitride layer wherein the substrate is nitrated (by plasma) followed by an oxidation treatment, which allows for an increased thickness of the initial oxynitride layer (columns 6 and 7).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the initial oxynitride of Kraft by the method of Ito since it allows for an increased thickness of the initial oxynitride layer.

In re claim 8, Kraft in view of Ito does not show wherein the final oxynitride layer further has a reduction effective electron mobility, μ_{eff}, of less than 20% from the effective electron mobility of the initial oxynitride layer.

However, since Kraft in view of Ito disclose the invention it would have been obvious to one having ordinary skill in the art at the time the invention was made to achieve the same reduction in effective electron mobility since the effective electron mobility is a direct result of the formation of the final oxynitride layer.

7. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kraft as applied to claims 1 and 5 above, and further in view of Gusev et al. ("Growth and characterization of ultrathin nitrided silicon oxide films" pp 1 – 22).

Kraft does not disclose wherein the initial oxynitride layer is formed upon the substrate by rapid thermal nitric oxide deposition.

However, Gusev in the article "Growth and Characterization of Ultrathin Nitrided Silicon Oxide Films, pp 1 – 22 discloses that by forming the oxynitride film with a rapid

thermal nitric oxide deposition, the nitrogen is more effectively incorporated in the dielectric film than by using N_2 or N_2O (pages 8 and 9).

Therefore It would have been obvious to one having ordinary skill in the art at the time the invention was made to form the initial oxynitride film of Kraft by the method of Gusev, because the nitrogen is more effectively incorporated in the dielectric film than by using N_2 or N_2O.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fernando Toledo whose telephone number is (703) 305-0567. The examiner can normally be reached on Monday – Friday, 8am – 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

	Fernando Toledo Patent Examiner Art Unit 2823

ft
February 19, 2002

Wael Fahmy
SUPERVISORY PRIMARY E
TECHNOLOGY CENTEI